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| 09/529,192 | 06/26/2000 | THOMAS JUNG | SPM-290-A | 9266 |

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EXAMINER

MARKHAM, WESLEY D

ART UNIT

PAPER NUMBER

1762

DATE MAILED: 08/13/2002

19

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/529,192

Applicant(s)

JUNG ET AL.

Examiner

Wesley D Markham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 June 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-9 and 12-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-9 and 12-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Continued Prosecution Application

1. The request filed on June 10, 2002 as paper #17 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 09/529,192 (which is a 371 of PCT/EP98/05982, filed on 9/18/1998) is acceptable and a CPA has been established. An action on the CPA follows.

Response to Amendment

2. Acknowledgement is made of applicant's amendment D, filed as paper #15 on 5/9/2002, in which Claims 1 and 14 were amended and Claims 10 and 11 were canceled. Acknowledgement is also made of applicant's preliminary amendment E, filed as paper #18 on 6/10/2002, in which Claims 23 and 24 were added. Claims 1, 3 – 9, and 12 – 24 are currently pending in the instant application, and an Office Action on the merits follows.

Claim Objections

3. Claims 1 and 23 are objected to because of the following informalities: The phrase, "...discharge activated by a DC voltage, a pulsed DC voltage, a pulsed DC voltage or a low-, ..." in Claims 1 and 23 appears to contain a typographical error. The applicant is suggested to amend the phrase to read, "...discharge activated by a DC voltage, a pulsed DC voltage, or a low-, ..." Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1, 3 – 9, and 12 – 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
6. Specifically, the term "low-, intermediate-, or high-frequency" in independent Claims 1, 14, 23, and 24 is a relative term which renders the claims indefinite. The term "low-, intermediate-, or high-frequency" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is unclear what range of AC voltage frequencies is encompassed by a "low" frequency, an "intermediate" frequency, and a "high" frequency. For the purposes of examination only, the examiner has interpreted the aforementioned limitation to encompass any AC frequency.
7. Regarding Claim 23, the limitation, "integrating all elements of the surface treatment process outside of a plasma zone" is vague and indefinite. Specifically, it is unclear what an element of the process is (i.e., is it a process step or limitation, or is it an actual component of the device used to perform the process?)
8. Claims 23 and 24 recite the limitation "a plasma zone" in the last line of each of the claims. There is insufficient antecedent basis for this limitation in the claims.

Specifically, it is unclear what the plasma zone is, as a plasma zone has not previously been referenced in either of the claims. For the purposes of examination only, the examiner has interpreted the plasma zone to be equivalent to the discharge region enclosed on at least two sides by substrate surfaces.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

10. Claims 1, 3 – 9, and 12 – 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Echizen et al. (USPN 5,527,391).
11. Regarding Claim 1, Echizen et al. teach a process for the surface treatment of at least one electrically conducting substrate or a substrate that has been coated so as to be conducting (Abstract and Col.28, lines 58 – 61), by means of a gas placed in the region of an electric discharge (Col.35, lines 53 – 55, and Col.10, lines 25 – 44), wherein the discharge zone is restricted on at least two opposite sides by

- surfaces to be treated (Figure 1 and Abstract). Specifically, Echizen et al. teach the continuous surface treatment of an electrically conductive band-shaped substrate with plasma. Echizen et al. does not explicitly teach that the band-shaped substrate forms a hollow cathode, and that the substrate surfaces are treated by "hollow-cathode glow discharge". However, the moving substrate confines the plasma discharge region to a hollow area (Figure 1). In addition, the band-shaped member (i.e., the substrate) may be directly used as an electrode for current passage (Col.28, lines 58 – 61). Therefore, the substrate acts as a "hollow cathode" in the process of Echizen et al. In addition, Echizen et al. teach that the discharge is activated by a microwave (Abstract), which is an example of a high-frequency AC voltage as required by Claim 1 (see, for example, Visser et al. (USPN 5,900,342) (Col.3, lines 1 – 4), Watanabe et al. (USPN 5,933,202) (Col.6, lines 34 – 40), and/or Matsuyama et al. (USPN 5,716,480) (Col.11, lines 1 – 8)).
12. Echizen et al. also teach all the limitations of Claims 3 – 9, 12, and 13 as set forth above in paragraph 11 and in paragraph 15 of the previous non-final Office Action (paper #7, mailed on 5/11/2001).
13. Regarding Claim 14, Echizen et al. teach a device for the surface treatment of at least one electrically conducting substrate or a substrate that has been coated so as to be conducting (Abstract, Col.28, lines 58 – 61, and Figures 1 – 4), the device comprising at least one substrate that defines a discharge region (Figure 1, reference number 101) enclosed on at least two sides by substrate surfaces (Figure 1, reference number 104), a means for supplying electrical energy to the

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discharge region (Figure 1, reference numbers 102 – 103), a vacuum chamber to enclose the discharge region (Figure 3, reference numbers 302 – 307), a means for supplying gas to the vacuum chamber (Figure 1, reference number 106), a means for removing gas from the vacuum chamber (Figure 1, reference number 107, and Figure 3, reference numbers 319, 321, and 323), and an anode placed in the region of the substrate (Col.26, lines 28 – 31). Echizen et al. does not explicitly teach that the substrate forms a hollow cathode. However, the substrate acts as a “hollow cathode” in the process of Echizen et al. (see paragraph 11 above). In addition, Echizen et al. teach that the discharge is activated by a microwave (Abstract), which is an example of a high-frequency AC voltage as required by Claim 14 (see, for example, Visser et al. (USPN 5,900,342) (Col.3, lines 1 – 4), Watanabe et al. (USPN 5,933,202) (Col.6, lines 34 – 40), and/or Matsuyama et al. (USPN 5,716,480) (Col.11, lines 1 – 8)).

14. Echizen et al. also teach all the limitations of Claims 15 – 20 as set forth above in paragraph 13 and in paragraph 17 of the previous non-final Office Action (paper #7, mailed on 5/11/2001).
15. Claims 1, 3 – 5, 7, 14, 15, 23, and 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Vanden Brande et al. (USPN 6,099,667).
16. Regarding independent Claim 1, Vanden Brande et al. teach a process for the surface treatment of at least one electrically conducting (i.e., metal) substrate (Abstract), the process comprising placing a gas in a region of an electric discharge

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(Col.1, lines 32 – 63), restricting the discharge region on at least two opposite sides by surfaces to be treated, wherein the one or more substrates form a hollow cathode and the substrate surfaces are treated by a hollow-cathode glow discharge (Col.4, lines 12 – 18), and wherein the discharge is activated by a DC voltage or an AC voltage (Col.2, lines 12 – 14).

17. Vanden Brande et al. also teach all the limitations of Claims 3 – 5 and 7 as set forth above in paragraph 16 and below, including a method wherein / further comprising:

- Claim 3 – One or more continuously supplied substrates are fed to restrict the discharge region in at least some areas of the region (Col.1, lines 59 – 63, and Col.4, lines 12 – 18).
- Claim 4 – The substrate(s) are band shaped (Col.1, line 61, and Col.3, line 10).
- Claim 5 – Turning at least one of the substrates at least once to change the direction of movement, wherein the discharge region is restricted on at least one side by the substrate before the turn and on at least one other side by the substrate after the turn. Specifically, Vanden Brande et al. teach that the hollow cathode for the annealing plasma is formed by the metal sheet moving in a zigzag or an accordion manner (i.e., a manner that involves turning the substrate at least once to change the direction of movement of the substrate) (Col.4, lines 15 – 18).
- Claim 7 – The electric discharge occurs at a pressure between 0.01 mbar and 100 mbar (Col.1, lines 34 – 35 and 49).

18. Regarding independent Claim 14, Vanden Brande et al. teach a device for the surface treatment of an electrically conducting substrate (Abstract and Figure), the device comprising at least one substrate defining a discharge region enclosed on at least two sides by substrate surfaces (Figure and Col.4, lines 12 – 18), means for supplying electrical energy to the discharge region (Col.2, lines 1 – 20), a vacuum chamber to enclose the discharge region (Col.1, lines 59 – 67), a means for supplying and removing gas from the vacuum chamber (Col.1, lines 40 – 45, and Figure – see openings on each side of the chamber “2”), a counter-electrode (i.e., an anode) placed in the region of the at least one substrate (Col.2, lines 1 – 20), wherein the at least one substrate forms a hollow cathode and is treated by hollow-cathode glow discharge (Col.4, lines 12 – 18) activated by a DC voltage or an AC voltage (Col.2, lines 12 – 14).
19. Vanden Brande et al. also teach all the limitations of Claim 15 as set forth above in paragraph 18, including a device wherein substrate cooling is provided (Col.2, lines 46 – 49).
20. Independent Claims 23 and 24 mirror independent Claims 1 and 14 (please see paragraphs 16 and 18 above), respectively, and, in addition, require that all elements of the surface treatment device be integrated outside of the plasma / discharge zone. Vanden Brande et al. teach this limitation. Specifically, Vanden Brande et al. make no mention of any device components in the hollow-cathode region formed by the zigzagging metal substrate (Col.4, lines 12 – 18).

21. Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

Claim Rejections - 35 USC § 103

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

23. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
24. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Echizen et al. (USPN 5,527,391) in view of Kashiwaya et al. (USPN 5,595,792).

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25. The combination of Echizen et al. and Kashiwaya et al. teach all the limitations of Claims 21 and 22 as set forth above in paragraph 13 and in paragraph 19 of the previous non-final Office Action (paper #7, mailed on 5/11/2001).
26. Claims 6, 9, 12, 13, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vanden Brande et al. (USPN 6,099,667) for the reasons set forth above in paragraphs 16 and 18 and below.
27. Regarding Claim 6, Vanden Brande et al. do not explicitly teach that the discharge region is restricted on two sides by substrate surfaces at a distance of 1 mm to 50 cm apart. Specifically, Vanden Brande et al. are silent as to the size of the region restricted on two sides by substrate surfaces. However, one of ordinary skill in the art would have reasonably recognized that the size of the hollow-cathode discharge region should not be (1) too large so as to lose the hollow-cathode effect and reduce plasma annealing efficiency or (2) too small so as to be impractical to implement in actual processing. In other words, the size of the discharge region formed by the substrate surfaces is a result / effective variable, and one of ordinary skill in the art would have optimized the aforementioned size through routine experimentation.
28. Regarding Claim 9, Vanden Brande et al. do not explicitly teach that the voltage applied between the substrate and the plasma formed by electric discharge is 1 V to 3000 V. Specifically, Vanden Brande et al. are silent as to the applied voltage. However, Vanden Brande et al. do teach a wide range of power densities that are

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utilized in their process (Col.2, lines 26 – 29). As applied voltage is directly proportional to power, it would have been obvious to one of ordinary skill in the art to optimize the applied voltage in the process of Vanden Brande et al. with the reasonable expectation of successfully obtaining a power density in the range desired by Vanden Brande et al.

29. Regarding Claims 12, 13, 16, and 17, Vanden Brande et al. do not explicitly teach that the gas is / can be fed into one of the discharge region and immediately outside the discharge region, and that the gas is / can be removed from one of the discharge region and immediately outside the discharge region. Specifically, Vanden Brande et al. teach utilizing a gas at a specified pressure in their plasma annealing process / device (Col.1, lines 32 – 49), but do not explicitly teach how or where the gas is introduced or removed from the vacuum chamber. However, it would have been obvious to one of ordinary skill in the art to introduce and remove the processing gas of Vanden Brande et al. as close as possible to the discharge region with the reasonable expectation of achieving a process having the greatest overall processing / cost efficiency because, by introducing the processing gas as close as possible to the area of plasma discharge, as little gas as possible is wasted (i.e., as gas that is not activated by the discharge and thus does not contribute to the plasma annealing process).

30. Claims 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vanden Brande et al. (USPN 6,099,667) in view of Baxter et al. (USPN 5,803,976).

31. Vanden Brande et al. teach all the limitations of Claims 18 and 20 as set forth above in paragraph 18, except for a method wherein the substrate is a continuously running band adapted to be unwound from a first spool and adapted to be wound onto a second spool (Claim 18), wherein the first spool and the second spool are arranged inside the vacuum chamber (Claim 20). However, Vanden Brande et al. do teach that the substrate is a continuously running sheet (i.e., band) (Col.1, lines 59 – 63) and that the sheet is rolled-up after processing (Col.3, lines 25 – 26). Baxter et al. teach that a conventional method for treating a continuous, running-length substrate is by utilizing a winding system that includes a pay-off roll and a take-up roll (Col.3, lines 29 – 40, and Col.4, lines 47 – 55). It would have been obvious to one of ordinary skill in the art to utilize a roll-to-roll system such as the system of Baxter et al. in the device of Vanden Brande et al. with the reasonable expectation of (1) success, as Vanden Brande et al. teach treating a continuously running sheet that is rolled-up after processing, and Baxter et al. teach that their system is capable of performing such a process, and (2) beneficially providing a device that is capable of performing the continuous, running-length treatment process of Vanden Brande et al. Regarding Claim 20, Baxter et al. also teach that the pay-off and take-up rolls may be located inside the vacuum chamber (Col.3, lines 33 – 35).

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32. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vanden Brande et al. (USPN 6,099,667) in view of Baxter et al. (USPN 5,803,976), and in further view of Behn et al. (USPN 4,301,765).
33. The combination of Vanden Brande et al. and Baxter et al. teaches all the limitations of Claim 19 as set forth above in paragraph 31, except for a device wherein the band is adapted to be introduced into and removed from the vacuum chamber by vacuum locks. Please note that Baxter et al. teach that the pay-off and take-up rolls can be located outside the vacuum chamber, as required by Claim 19 (Col.3, lines 33 – 35). In addition, Vanden Brande et al. teach utilizing an “outlet lock” through which the sheet passes and is then rolled-up (Col.3, lines 25 – 26). Behn et al. teach that vacuum locks were known at the time of the applicant’s invention in a process of treating a moving substrate (i.e., a process analogous to that of Vanden Brande et al.) (Abstract and Col.3). It would have been obvious to one of ordinary skill in the art to utilize vacuum locks at the entrance and exit portions (of the continuously running sheet) of the vacuum chamber of Vanden Brande et al. with the reasonable expectation of (1) success, as Vanden Brande et al. teach utilizing an “outlet lock” through which the sheet passes after treatment, and Behn et al. teach that vacuum locks were known at the time of the applicant’s invention in a process similar to that of Vanden Brande et al., and (2) obtaining the benefits of utilizing vacuum locks, such as allowing the metal sheet to enter and exit the chamber (see Figure of Vanden Brande et al.) while controlling / maintaining the

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appropriate pressure within the chamber, as clearly desired by Vanden Brande et al. (Col.1, lines 34 – 49).

34. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vanden Brande et al. (USPN 6,099,667) in view of Kashiwaya et al. (USPN 5,595,792).

35. Vanden Brande et al. teach all the limitations of Claims 21 and 22 as set forth above in paragraph 18, except for a device wherein the applicant's claimed deflection elements are utilized. However, utilizing such deflection elements would have been obvious to one of ordinary skill in the art in view of Kashiwaya et al. for the reasons set forth in paragraph 19 of the previous non-final Office Action (paper #7, mailed on 5/11/2001).

Response to Arguments

36. Applicant's arguments filed on 5/9/2002 and 6/10/2002 have been fully considered but they are not persuasive.

37. First, the applicant argues that Echizen et al. teach activating the discharge by microwaves, not a DC voltage, a pulsed DC voltage, or a low-, intermediate-, or high-frequency AC voltage. In response, microwaves are an example of a high-frequency AC voltage (please see paragraph 11 above).

38. Second, the applicant argues that independent Claims 1 and 14 have been amended and narrowed to be restricted to a hollow-cathode discharge, and not to

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include a "normal" discharge. In response, it does not appear that such an amendment has been made. The applicant's claims are read in light of the specification, which clearly states that a hollow-cathode discharge includes a discharge in the transition region between hollow-cathode discharge and normal discharge (page 3, lines 11 – 13). Thus, the applicant's claims are not limited to a purely hollow-cathode discharge.

39. Third, the applicant argues that Echizen et al. do not teach all the limitations of new Claims 23 and 24 because the claims require integrating all the elements of the surface treatment device outside of the plasma / discharge region, and Echizen et al. show a dielectric tube and a plurality of rollers in the discharge region. In response, please note that the Echizen et al. reference has not been applied against Claims 23 and 24.

Conclusion

40. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (703) 308-7557. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.
41. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are

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(703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

42. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Wesley D Markham
Examiner
Art Unit 1762

WDM

WDM
August 9, 2002


SHRIVE P. BECK
SUPERVISORY PATENT EXAMINER
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